

For Reference

NOT TO BE TAKEN FROM THIS ROOM

For Reference

NOT TO BE TAKEN FROM THIS ROOM

Ex libris
UNIVERSITATIS
ALBERTAENSIS



THEORY OF THE EARTH

THEORY OF THE EARTH
AND ITS HISTORY

BY
J. H. MACLEOD

OF THE
UNIVERSITY OF GLASGOW

1890

THE UNIVERSITY OF GLASGOW
AND THE UNIVERSITY OF ABERDEEN
PUBLISHED BY THE UNIVERSITY PRESS

GLASGOW AND ABERDEEN

PRINTED BY THE UNIVERSITY PRESS

GLASGOW AND ABERDEEN

1890

THE UNIVERSITY OF ALBERTA

THE NATURE AND PLACE OF A FIELD OF
KNOWLEDGE IN PHYSICAL EDUCATION

by

ROBERT JOSEPH PADDICK

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF MASTER OF ARTS

FACULTY OF PHYSICAL EDUCATION

EDMONTON, ALBERTA

APRIL, 1967

UNIVERSITY OF ALBERTA
FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "The Nature and Place of a Field of Knowledge in Physical Education," submitted by Robert Joseph Paddick in partial fulfilment of the requirements for the degree of Master of Arts.

ABSTRACT

On the basis of a distinction between scholarly and professional activities within an area of knowledge, and on the assumption that Physical Education, as a subject area can support this distinction, the nature of a possible scholarly area or subject matter is investigated.

From the writings in the field the subject matter is synthesized as the interaction of man and his movements. The study of this interaction is called the study of performance.

In preparation for the account of the nature of the field of knowledge of performance, the concept of a field of knowledge is examined. The role of a conceptual structure is discussed and it is shown that the conceptual structure determines the nature of the field of knowledge.

On the self-evident premises that man is an organism and a personality (hence his movements are meaningful to him) the following factors, considered as processes, are offered as a means of encompassing all the relevant variables for the explanation of the regularities and differences among performances: the mechanical process, the energy process, the organization process, the growth process and the learning process.

The problem of classifying movements is discussed, and the notions of force and meaning are seen to be central.

In its approach to the phenomena of study, a field of knowledge which could develop out of the conceptual structure outlined, is basically different in orientation to those basic life sciences on which it rests, in that it is concerned with man both as an organism and as a personality. These two levels interact and hence an explanation of performance needs to consider this interaction. The same field of knowledge, it seems, could sustain the professional activity in the field by providing a subject matter relevant to the process of physical education.

ACKNOWLEDGEMENTS

Many people have contributed to the production of this thesis. When reviewing the list one would expect a work of outstanding quality. Only the inadequacies of the author have prevented their combined efforts from achieving full effect.

I particularly thank Dr. Alderman for his expert guidance and for his constant faith that the thesis was a worthwhile venture. I am grateful to the other members of my committee, Dr. Austin, Professor Kemp and Professor Elliott for their unstinting guidance in their particular areas.

The large army of unknowing assistants led by Professor Affleck and my wife receive my thanks for their willingness to be exploited in hounding down minutiae, and in clarifying my ideas.

I thank all these people for a valuable academic experience which may not be apparent to the reader.

TABLE OF CONTENTS

CHAPTER		PAGE
I	STATEMENT OF THE PROBLEM	1
	Introduction	1
	The Problem.	4
	Importance of the Study.	5
	Procedures	7
	Definition and Explanation of Terms.	8
	Subject area	8
	Physical Education	8
	Field of Knowledge	9
	Academic Discipline.	9
	Place.	9
	Nature	10
	Related Subject Areas.	10
	Structure.	10
	Assumptions.	10
	Delimitations.	10
II	THE SUBJECT MATTER OF PHYSICAL EDUCATION	12
	Introduction	12
	"Physical Education" as an Unsatisfactory Term	13
	Proposed uses of "Physical Education".	18
	A Definition of the Subject Matter	20

TABLE OF CONTENTS (Cont'd)

CHAPTER		PAGE
III	THE CONCEPT OF A FIELD OF KNOWLEDGE.	24
	Introduction	24
	The Basis of Knowledge	25
	Scientific Knowledge	27
	Distinction Between the Disciplines. . .	31
	Values of the Conceptual Structure . . .	33
	Summary.	35
IV	THE NATURE OF A FIELD OF KNOWLEDGE OF PER- FORMANCE	37
	Introduction	37
	Man as a Multi-dimensional Organism. . .	41
	Man as a Personality	45
	A Conceptual Structure of Performance. .	49
	The Mechanical Process	50
	The Energy Process	52
	The Organization Process	53
	The Learning Process	55
	The Growth Process	56
	Movement	57
	Summary.	59
V	THE PLACE OF A FIELD OF KNOWLEDGE OF PER- FORMANCE	61
	Introduction.	61
	Relation to Other Fields of Knowledge .	61
	The Place Within the Subject Area . . .	63
VI	SUMMARY.	69
	BIBLIOGRAPHY	74

CHAPTER I

STATEMENT OF THE PROBLEM

Introduction

In this study it is necessary to distinguish two types of activity to be found within a given area of knowledge: scholarly (or academic) and professional activity. Scholarly activity may be considered as that in which understanding alone is the aim, whereas professional activity is that in which the aim is to render a service to the community on the basis of understanding. Thus, scholarly activity is work within the subject matter itself, while professional activity involves moving outside the subject matter to apply the knowledge to particular problems. This distinction is well known, of course, when applied to research within an area as marking off pure or "theoretical" research from applied or "regulative" research.¹

It should be noted that these are restricted uses of the words 'scholarly' and 'professional'. They are being used only to mark the distinction between knowledge being developed and knowledge being used. In calling the development of knowledge scholarly activity, nothing is being implied about the quality of the activity. Similarly, the separation of

¹N.P. Neilson and A.O. Bronson. Problems in Physical Education (Englewood Cliffs, N.J.: Prentice Hall, 1965), p. 13.

professional activity from scholarly activity in no way implies that the former might not be pursued in a scholarly manner.

Within the area of pure research a further distinction can be made. Empirical research involves the subjecting of concepts to experimental tests in the laboratory. Theoretical research (not in the sense of Neilson and Bronson above) is concerned with the organization of these and other concepts into internally consistent systems which constitute the body of knowledge in that subject area at any given time.

These three distinguishable types of activity (scholarly, research and professional) are to be found in most if not all subject areas. The absence of any one of them may indicate lack of development. In particular, the absence of scholarly activity, or theoretical research, may be regarded as serious in that the subject matter is central to both the professional and empirical activities of the area.

There are at present research and professional activities bearing the name 'Physical Education'. However, there has been considerable concern expressed about the lack of scholarly activity, that is, about the development of a systematic subject matter.² Henry pinpoints the nature of the

²For example the following: F.M. Henry, Collegiate Physical Education and Research, Address given at Western College Men's P.E. Society Annual Meeting, Reno, Nevada, Oct. 1964; J.W. Postma, "The Theory of Physical Education as a Scientific Discipline," Physical Education 55 Mar. 1963; R. Abernathy, "The Search for Significant Persistent Theories in Physical Education," Journal of Health, Physical Education and Recreation 36.3 Mar. 1965, pp. 26-29; L.F. Locke, "The Use of Theory in Physical Education," Australian Journal of Physical Education

problem in terms of the scholarly-professional distinction when he says that "in fact physical education has the doubtful distinction of being a school subject for which colleges prepare teachers but do not recognize a subject field".³

Examination of the pure research, (the research not concerned with problems in education), reveals it to be primarily empirical, somewhat reminiscent of Forscher's brickyard.⁴ In an extended metaphor, Forscher equates the collecting of facts with the making of bricks. He emphasizes that just as bricks are meant for the building of edifices so facts have meaning in terms of theoretical structures. Accordingly, bricks and facts alike should be made to order, otherwise there is the risk of accumulating a lot of bricks and facts which do not fit anywhere and are therefore meaningless or useless. The report by Howell⁵ of nearly a hundred studies in the area of muscular development illustrates the kind of situation over which Forscher is concerned. The studies are haphazard and unrelated except in the trivial sense of being roughly in the same area. As a

25: 1962 p.15: and A.H. Steinhaus, Toward an Understanding of Health and Physical Education (Dubuque, Iowa: W.C. Brown Co., 1963), p. 262.

³F.M. Henry, "Physical Education. An Academic Discipline", Journal of Health, Physical Education and Recreation 35 Sept. 1964, p. 32.

⁴B.K. Forscher, "Chaos in the Brickyard," Science 142: 2590 October 8, 1963.

⁵M.L. Howell, "The Development of Strength and Muscular Endurance by Isometric Contractions," Proceedings of Third B.E. and C. Conference on Physical Education, Perth, 1962, pp. 20-41.

result, nothing is built in the way of a theoretical structure.

However, there have been those who like Schrecker deride the idea of a theoretical subject matter:

Under these circumstances, unwilling to abandon the cause of physical education and yet lacking the necessary enthusiasm for it, which can accrue only from successful teaching, many of them try to prop dwindling belief in their work by an accumulation of positive knowledge about it.⁶

This objection rests on falsely equating the accumulation of positive knowledge about physical education with the development of a subject matter which the teacher can use in the process of education.

Thus the context for this study can be stated as follows. A subject area can be divided into activities which can be distinguished under the headings of 'scholarly', 'research' and 'professional'. Considering Physical Education as a subject area, research and professional activities are obvious, but doubt has been expressed by writers in the field about activities of a scholarly kind, that is about the development of a subject matter. In this context a subject matter has the form of a field of knowledge.

The Problem

It is the purpose of this study to establish the nature and place of a field of knowledge in Physical Education.

The nature of the field of knowledge will logically follow from the orientation of those engaged in research in

⁶K.A. Schrecker, "Scientific Physical Education," Physical Education 44, 1952, p. 133.

the field. Thus it can be developed from the definition of the phenomena being studied.

The place of the field of knowledge can be considered in two dimensions. Firstly the field bears a relationship to other fields in the total body of knowledge. Thus it occupies a place in this total body of knowledge. Secondly the field of knowledge, being the subject matter of the subject area bears a relationship to the research and professional activities of the subject area. Thus it occupies a place within the subject area.

Importance of the Study

If the subject matter has been neglected as Henry suggests when he says:

The present senior generation of physical education educators mostly received their doctorates in education, thus it is understandable that their orientation has been towards the profession of education rather than the development of a field of knowledge.⁷

then the quality of both physical education research and professional activities may be affected adversely. Without theoretical research, hypotheses for empirical research are not developed out of an organization of concepts and research then is merely fact gathering; or they are developed out of concepts from another subject area. Similarly, a lack of scholarly activity decreases the effectiveness of the professional activity, for as Orban suggests:

⁷F.M. Henry, "Physical Education. An Academic Discipline," Journal of Health, Physical Education and Recreation 35 Sept. 1964, p. 32.

Because the service which is rendered must be an application of this acquired knowledge, its quality is directly related to the amount and quality of knowledge.⁸

Also, with a poorly developed subject matter the training of teachers must be open to criticism.⁹ Henry again indicates the source of the problem when he draws attention to the fact that the physical education teachers are traditionally trained differently from teachers in other subject areas.¹⁰ Abernathy and Waltz suggest the following solution to problems of this kind:

A physical education program built upon a sound foundation of knowledge about human movement could have much greater potential for the realization of the goals of education.¹¹

This point will be elaborated in Chapter Five.

Thus, if these deficiencies exist, there is need to clarify the place and nature of the subject matter, because the subject matter is the focal point of all the activities bearing the name of the subject area. Each group supplements this subject matter in different ways: the research worker with knowledge of such things as statistics, experimental design and a specialized area; the teacher with a knowledge of children, education, and teaching techniques; the recreation leader with a knowledge of administration and sociology, and so on.

⁸W.A. Orban, "Research and our Profession," Journal of Canadian Association of Health, Physical Education and Recreation 28:4, 1960, p. 30.

⁹See both Nielson and Bronson op. cit. p. 175; and D.A. Cunningham, "Physical Education as an Academic Discipline," Journal of Canadian Association of Health, Physical Education and Recreation 31:6, Aug. 1965, p. 21.

¹⁰Henry, loc. cit.

¹¹R. Abernathy and M. Waltz, "Towards a Discipline; First Steps First," Quest, Monograph II, April 1964.

Procedures

In attempting to set out the subject matter of Physical Education in the form of a field of knowledge, this study approaches the problems indicated above from only one direction. It is concerned with fitting Physical Education into the traditional pattern of subject areas found in a university. The justification for making this attempt comes from two sources. Firstly Physical Education already has much of the appearance of the traditional subject areas in that it has research and professional activities. Secondly many writers have felt that Physical Educators should seek this academic structure for their subject and it is in support of this view that the study has been organized.¹²

The material to be covered in the various chapters has been indicated in a general way in the introduction. It remains to indicate the relevance of the problems introduced to the purpose of the study as stated.

Chapter Two will examine further the distinction between scholarly and professional activities in the subject area of Physical Education by discussing definitions of the term 'Physical Education'. Observing the distinction, a definition of the subject matter will be synthesized from literature in the field. The identification of the phenomenon to be studied is the first step in setting out the field of knowledge. An

¹²See Postma, loc. cit.; Henry, loc. cit.; Abernathy and Waltz, loc. cit.; Cunningham, loc. cit.; A. Daniels, "The Potential of Physical Education as an Area of Research and Scholarly Effort," Journal of Health, Physical Education and Recreation, Jan. 1965, p. 32.

incidental outcome of this chapter will be the clarification of terms.

Chapter Three will discuss the concept of a field of knowledge in order to complete the preparation for Chapter Four where the definition developed in Chapter Two will be expanded to indicate the nature of the field of knowledge in Physical Education.

The purpose of Chapter Five is to discuss the relationship of a field of knowledge having the nature indicated, to certain other fields of knowledge, and also to professional and research activities within the subject area.

Definition and Explanation of Terms

Subject area: All activities normally referred to by the name of the subject, from school to university. When referring to the subject area which includes, among other things, research, study, teaching, the name will be capitalized, e.g., Physical Education, Physics.

Physical Education: The process of education associated with a school program based on the subject matter of the field, and traditionally centred around physical activities. Its use is analogous to the use of "science education". The restriction to school program is based on the assumption that it is the formal organized use of physical activity in education that is of concern to physical education. The restriction to educational uses is based on the common use of the term by writers in the field. The 'physical' in 'physical education' indicates the use of physical activities. This avoids the

necessity to explain 'physical' in terms of the 'mental-physical' distinction.

Field of knowledge: The present organization of explanations of the class of phenomena named by the definition of the field, in terms of concepts not used for this class of phenomena in other fields. "The acquisition of such knowledge is assumed to be an adequate or worthy objective as such without any demonstration, or requirement of practical application. The content is theoretical and scholarly as distinguished from technical and professional."¹³ This definition is based on the assumptions that knowledge involves understanding, that understanding depends on explanation, and that it is possible to distinguish between the accepted fields of knowledge in terms of the phenomena studied and the concepts used in the explanations of these phenomena.

Academic discipline: An organized field of knowledge collectively embraced in a formal course of learning.¹⁴

Place (of a field of knowledge): The theoretical role or function within the subject area, and also the contributions to the development of the total body of knowledge in relation to the fields of knowledge of related subject areas. This definition is based on the assumptions that it is possible within a subject area to distinguish knowledge from the use of

¹³F.M. Henry, "Physical Education. An Academic Discipline," Journal of Health, Physical Education and Recreation 35, Sept. 1964, p. 32.

¹⁴Ibid.

that knowledge, and that each field of knowledge makes a unique contribution to the total body of knowledge.

Nature (of a particular field of knowledge): The characteristics which distinguish a particular field of knowledge from other fields of knowledge and which are essential for it to be considered a field of knowledge.

Related subject areas: Those subject areas whose fields of knowledge at present contribute to an understanding of phenomena of interest to those engaging in Physical Education, e.g., Physiology, Psychology, Sociology, Anatomy, Mechanics.

Structure of (a subject area): The relationships between the areas of knowledge associated with the research, scholarly and professional activities comprising a subject area.

Assumptions

As a basis for this study the following assumptions have been adopted:

(1) In terms of its structure, Physical Education need be no different from other subject areas involving research and educational applications.

(2) Subject areas of the kind considered in this study can be divided into areas of activity classed as research, scholarly, professional.

Delimitation

The thesis topic covers a broad area and therefore will necessarily be restricted in depth. In view of the diversity of thinking within this area, the proposed broad approach

is justified on the conviction that this type of analysis is a necessary prerequisite to the detailed analysis of the many problems which still remain. This thesis is seen then as an attempt to aid the clarification of an area in which more analysis is required.

The thesis is not an attempt to establish an academic discipline called physical education.

CHAPTER II

THE SUBJECT MATTER OF PHYSICAL EDUCATION

The scientist is still saying "it depends on what you mean by. . .," and the layman's still resenting that answer.

Robinson.

If my critic friends would really like to find a term to criticize I should suggest that they give attention to the words "physical education". Here is a semantically indefinable term, which like the term malaria we continue to use because of its old associations.

McCloy.

Introduction

The aim of this chapter is to establish the reference of the phrase 'the subject matter of Physical Education'. This reference will be expressed in the form 'the study of _____'. The name of the class of phenomena which is to be studied will fill the blank. Identification of the focus of attention is the first step in demonstrating the nature of the field of knowledge.

The reference of the phrase the subject matter of 'Physical Education' will be identified by examining the various uses of the term 'Physical Education' and by classifying the varied denotations¹ on the basis of the distinction between

¹The denotation of a term is the collection of all those things to which the term refers.

scholarly and professional activities which was introduced in Chapter One.

In this way two purposes related to the success of the study will be advanced. Firstly, the distinction between scholarly and professional will be further explicated by being applied to a particular example. Secondly, the terms will be subjected to a rigorous analysis. This attention is necessary to ensure that inferences made from the terms can be assessed accurately.² In a study such as this, successful argument begins with the precise and consistent use of terms. Thus this chapter has the secondary purpose of avoiding the activity that Robinson is referring to when he says:

At first it does not occur to people to start by getting terms on whose application there will be universal agreement. Instead they spend their time arguing whether this is 'T', that is whether the term 'T' applies to the given object. The process of criticising the term 'T' and redefining it by stipulation into something whose applications will not admit of argument appears to them perverse and useless; useless because what they want to establish is whether this is a case of 'T' in the ordinary sense; and perverse because everyone knows perfectly well what 'T' means.³

'Physical Education' as an Unsatisfactory Term

The uses of 'Physical Education' are both vague and ambiguous.⁴ They are vague in the sense that the connotations

²R. Robinson, Definition (Oxford: Clarendon Press, 1954), p. 68.

³Ibid., p. 69.

⁴W.V.O. Quine, Word and Object (Cambridge, Mass.: M.I.T. Press, 1964), pp.125-134.

of the term are not clear because of the problems arising from the use of 'physical' and of 'education', and they are ambiguous in the sense that they employ varied denotations, which result in confusions over truth and falsity of statements containing the term. The details of these criticisms are set out in what follows.

Several writers have expressed concern over the meanings of the word 'physical' in 'physical education',⁵ mainly because of the desire to avoid any suggestions of an explanation of 'physical' in terms of a physical-mental distinction. Usually the solution is to explain 'physical' as indicating 'physical activity' the medium which the physical educator uses.⁶ Theoretically this does not help a great deal because the explanation of the word "physical" is merely pushed further into the background. More recently Metheney has indicated that perhaps 'physical' in 'physical education' may be explained as referring to the forces of the physical world--that is, the world described by physics. Man interacts with these forces when he moves.⁷

⁵See C. Brown and R. Cassidy, Theory in Physical Education, A Guide to Programme Change (Philadelphia: Lea & Febiger, 1963), p. 30; C.A. Bucher, Foundations of Physical Education (St. Louis: C.V. Mosby Co., 1960), p. 34; N.P. Nielson & A.O. Bronson, Problems in Physical Education (Englewood Cliffs, N.J.: Prentice Hall Inc., 1965), p. 24.

⁶J.F. Williams, The Principles of Physical Education (7th edition; Philadelphia: W.B. Saunders Co., 1959), p. 4; and C.H. McCloy, Philosophical Bases of Physical Education (New York: 1947), p. 6.

⁷E. Metheney, Connotations of Movement in Sport and Dance (Dubuque, Iowa: W.C. Brown, 1965), p. 15.

The term 'education' has contributed further to the vagueness of the term 'physical education' because it does not have a clearly defined meaning. This has made it necessary for writers on physical education to spend time defining 'education' in the first few pages of their books.⁸ The necessary superficiality of such brief treatments has not helped to promote understanding, and as a result the vagueness is perpetuated.

Moreover the presence of the term 'education' has been conducive to confusion by obscuring the scholarly-professional distinction. Attention has been directed away from the subject matter of Physical Education and towards the use of the subject matter in education. As a result, analyses of physical education have been made in relation to the aims of education.

Furthermore, the majority of the definitions presented in writings on physical education are specifically constructed to emphasize the link with educational activities.⁹ Other school subjects avoid the confusion simply because the term 'education' is not included in their titles, e.g. physics rather than physics education. When writers have made a plea for identification of the subject matter, others, who are not aware of these confusions have objected, reasserting the link

⁸ Bucher, op. cit., p. 31; Neilson and Bronson, op.cit.; E.W. Nixon & F.W. Cozens, An Introduction to Physical Education (Philadelphia, W.B. Saunders Co., 1942), pp. 46-69.

⁹ Williams, op. cit., p. 4; Bucher, op. cit., p. 40; McCloy, op. cit., p. 24; C.C. Cowell and W. France, Philosophy and Principles of Physical Education (Englewood Cliffs, N.J.: Prentice Hall, 1963), pp. 31, 32.

of 'physical education' to 'education'.¹⁰

Writings on professional preparation discuss such things as dedication, honesty, and appearance, but often neglect to mention the knowledge of subject matter essential to any professional activity.¹¹ It seems then that the vagueness of the term 'physical education' has been closely associated with both the failure to observe the distinction between scholarly and professional activity, and also with the professional bias. Thus, in this study in which the professional-scholarly distinction is basic, and in which attention is being directed towards the subject matter, it is important to avoid these traditional confusions.

Accepting that definitions of physical education have been oriented towards the professional activity of the subject area, there has still been ambiguity. Abernathy indicates this when she says:

Physical education is described as a program or a series of programs, and at the same time as an activity, or a group of activities. In addition there are variant definitions couched in terms of purposes, process, organization procedures and outcome.¹²

¹⁰ K.A. Shrecker, "Scientific Physical Education," Physical Education 44: 1952; I. Ward, Letter to the Editor, Leaflet, Dec. 1962, p. 77; and Cowell & France, op. cit., 37, 38.

¹¹ W.A. Orban, "Research and our Profession," Journal of Canadian Association of Health, Physical Education and Recreation, 28:4, 1962, p. 30; and Nielson & Bronson, op. cit., p. 175.

¹² R. Abernathy, "The Search for Significant Persistent Themes in Physical Education," Journal of Health, Physical Education and Recreation, 36:3, Mar. 1965, pp. 26-29.

Bucher refers to it as "a field of endeavour";¹³ Randall uses it as synonymous with 'physical activity';¹⁴ Jokl uses it in the title of a book about sport only;¹⁵ Brown and Cassidy use it to refer to a particular part of the school program;¹⁶ and Cowell refers to it as a social process of change in behaviour.¹⁷ Thus it is clear that the term 'physical education' is what Habenstein has called a "common-sense conventional appellation, that means remarkably different things to different groups and persons."¹⁸

These varied uses of the term are only a source of confusion when their application on a particular occasion is not clear. Obviously the term can legitimately be used to refer, on different occasions, to the many different kinds of activity that make up the subject area Physical Education. However, when for example 'physical education' is used to refer to a field of knowledge, and the reader is thinking in terms of a school program, needless confusion results.¹⁹ In addition, the

¹³Bucher, op. cit., p. 40.

¹⁴M.W. Randall, Modern Ideas on Physical Education (2nd edition, London: G. Bell & Sons, 1961).

¹⁵E. Jokl, Medical Sociology and Cultural Anthropology of Sport and Physical Education (Springfield: C.C. Thomas, 1962).

¹⁶C. Brown and R. Cassidy, Theory in Physical Education A Guide to Programme Change (Philadelphia: Lea & Pebiger, 1963).

¹⁷Cowell and France, op. cit., p. 31.

¹⁸R.W. Habenstein, "Critique of 'Profession' as a Sociological Category," The Sociological Quarterly, Autumn 1963.

¹⁹Schrecker, loc. cit.; Ward, loc. cit.

term sometimes is used in two different ways at once by the same person. A common example of this ambiguity is reference to physical education as 'the art and science of human movement'.²⁰ Here the reader is required to supply two meanings to 'physical education' in order to make the sentence true. One meaning will not suffice. For example physical education is at once seen as activity (art), and also as the study of activity (science).

Proposed Uses of 'Physical Education'

'Physical Education', (capitalized) will be used as a general term to refer to the subject area as the sum of all those activities conducted in schools, colleges and universities under the name 'physical education'. It includes those activities of a scholarly, professional and research nature associated with the subject matter which has yet to be defined.

'Physical education' will be considered as analogous to 'history education', 'science education' or 'scientific education' in denoting the process or product of education associated with a particular area of knowledge. In the professional activity of education, the educator has the particular aim of educating the pupil with regard to his subject area,

²⁰For example: D.B. Van Dalen, Ed. Mitchell, B.L. Bennett, A World History of Physical Education (Englewood Cliffs, N.J.: Prentice Hall Inc., 1956), p. 595; Brown and Cassidy, loc. cit.; R. Abernathy and M. Waltz, "Towards a Discipline, First Steps First," Quest, Monograph II, April 1964; and R. Synder, "The Scope of Physical Education," Current Administrative Problems (Washington: AAHPER, 1960), p. 52.

and the general aims of developing the pupil along lines suggested by society. The outcome then of a general or liberal education--the resultant of several interacting specific educations--is the educated man "who has come to grasp meaning and the ability to think on different occasions historically, philosophically, scientifically, aesthetically and so on".²¹ In this sense then, only by identifying the subject matter of physical education can the particular contribution of the subject be assessed.

Following upon this use of 'physical education', one of the aims of the physical educator is to educate the pupil with regard to a particular subject area. No doubt the concentration on the contribution of physical education to the general aims of education (as indicated earlier) is associated with the lack of an identifiable subject matter. This has meant of course that the particular, unique contribution of this part of the education process has been restricted to the development of skills and fitness through activity.

There has, however, recently been an increased awareness of the inadequacy of this state of affairs. Many writers have turned their attention to the development of concepts about a subject matter, endeavouring to educate the pupils to think in certain desirable ways about that particular part of their experience with which the subject matter is concerned,

²¹M. Belth, Education as a Discipline (Boston: Allyn and Bacon, 1965), p. 216.

i.e. "to make an intelligent choice", as suggested by Herman and Osness.²² This might be called "learning to think in a physical education way"; an analogous process to Belth's thinking historically, or scientifically.

A Definition of the Subject Matter

In attempting to define his field of knowledge Malinowski sees that he has "to define in what relation to one another the various branches of anthropology really stand".²³ This involves synthesizing a common element or focus of interest from the activities of those working in the field.

As has been indicated, the attention in Physical Education has been traditionally towards the professional activity in the field, leading the reader to infer the underlying subject matter. Where it has been identified it has been referred to as the foundations of physical education and has been merely a collection of parts of other disciplines, such as exercise, physiology and motor learning.

Therefore it is easier to list the phenomena to which physical educators have devoted their attention than to provide

²²J.E. Nixon & A.E. Jewett, Physical Education Curriculum (New York: Ronald Press Co., 1964), p. 108; P. Johnson, "An Academic Approach to College Health and Physical Education," Journal of Health, Physical Education and Recreation, 37:3, Mar. 1965, p. 23; AAHPER, This is Physical Education, 1965; and D. Herman & W. Osness, "A Scientific Curriculum Design for High School Physical Education," Journal of Health, Physical Education and Recreation, 37:3, Mar. 1966, p. 26.

²³B. Malinowski, A Scientific Theory of Culture and Other Essays (New York: Oxford University Press, 1960), p. 4.

an intensional²⁴ meaning for 'the subject matter of Physical Education'. Physical activity, motor performances, movement, sports, games, athletics, exercise, play, dance, and physical fitness, with various qualifications and in various combinations have been offered as the phenomena with which Physical Education is 'really' concerned. This list provides a guide in the task of proposing a definition.

Of those who have attempted to find the core of Physical Education, i.e. the subject matter, most have suggested "the study of human movement".²⁵ While this does not particularly indicate the kinds of movements in which physical educators are interested, it has the advantage of obviously including (in a precise form) all those phenomena listed, except perhaps the area of physical fitness with which physical educators have traditionally been concerned. In an effort to improve upon this at a superficial level, it is proposed that "the subject matter of physical education" be taken to mean "the study of the interaction of man and his movements". The full import of this preference will become apparent in Chapter Four.

The word 'interaction' draws attention both to the

²⁴That is, to give the defining characteristics.

²⁵Abernathy, op. cit.; Brown and Cassidy, op. cit.; V. Hunt, "Movement Behaviour, A Model for Action," Quest, Monograph II, April 1964, pp. 69-91; AAHPER, Professional Preparation in Health Education and Physical Education and Recreation Education (Washington: AAHPER, 1962); Cowell and France, op. cit.; and Nixon and Jewett, op. cit.

effects that movement has on man--indicating the area of physical fitness, exercise and training--and at the same time includes those activities which result from man paying attention to his movements; his organization of them in the various physical activities, games and sports. It serves to indicate that it is not movement itself but the relationship between man and movement that is the object of study. When the phenomena being studied are considered from this point of view, they will be referred to as performances. A performance then is a phenomenon consisting of man moving, analyzed in terms of the interactions occurring.

Thus, in summary, Physical Education is the sum of all those activities, scholarly, professional and research, which develop and use the knowledge from the study of the interaction of man and his movements; physical education is the educational process that has as its particular aim, the education of students with regard to that area of their experience which is studied in this subject area.

Having defined "the subject matter of physical education", the next step is to expand this definition, by developing its implications. In that this definition constitutes a summary of the interests of those in the subject area of Physical Education (within the scholarly-professional distinction), the logical development will be an account of the field of knowledge.

If a discipline is viewed as a sequential arrangement of a body of knowledge, and if a body of knowledge is derived from the field of inquiry which in turn is defined by the

problems it seeks to resolve, a structure for inquiry may be approached through an identification of general areas of concern within which questions can be asked.²⁶

²⁶Abernathy and Waltz, loc. cit.

CHAPTER III

THE CONCEPT OF A FIELD OF KNOWLEDGE

Bacon himself characterizes the scientist as being neither wholly speculative and like a spider spinning his web from his own substance, nor wholly empirical and like an ant collecting data in a heap, but like the bee feeding on nectar it gathers, digesting it and so transmuting it into purest honey.

Kaplan

We now realize how much in error were those theorists who believed that theory could be inductively derived from facts.

Einstein

Introduction

The purpose of this chapter is to examine the concept of a field of knowledge in preparation for the following chapter when the particular field of knowledge associated with Physical Education is considered. Such an examination follows the suggestion of Taba, who says that much of the confusion in problems of the kind dealt with in this study, arises because of a lack of understanding about such terms as 'subject matter' and 'discipline'.¹ The domain² of this field of knowledge

¹H. Taba, Curriculum Development. Theory and Practice (New York: Harcourt, Brace and World, 1962), p. 172.

²The domain of a discipline is that natural phenomenon,

has been indicated in Chapter II, and hence at the end of this chapter the necessary preparation for a discussion of the nature of a field of knowledge in Physical Education will be complete.

Throughout this chapter 'body of knowledge', 'field of knowledge' and 'discipline' will be used interchangeably in spite of the fact that the latter usually has connotations not relevant to its use here. Thus the three terms which are to be explicated are defined as the "present organization of explanations of the class of phenomena named by the definition of the field in terms of concepts not used for this class of phenomena in other fields". The various factors indicated in this definition will be clarified during the course of this chapter. As stressed in Chapter I, a discipline is to be clearly distinguished from a profession; a discipline "having as an objective 'the understanding of some portion of reality', a profession having as its "fundamental goal, the altering of some aspect of reality".³

The Basis of Knowledge

Man's knowledge of the world is based on his contact with the world by means of his senses. Quine pictures man as

process, material, social institution or other aspect of man's concern on which the members of the discipline focus their attention, A.R. King Jr., J. Brownell, The Curriculum and the Disciplines of Knowledge (New York: John Wiley and Sons Inc., 1966), p. 74.

³G.S. Kenyon, "Sport Sociology: On Becoming a Sub Discipline," (paper read at History and Philosophy Section, AAHPER National Convention, Chicago, March 18, 1966).

being bombarded by a continuous 'flux of experience' which he organizes into a picture of reality.⁴ This organization is a very complex process but it sufficiently serves this study to note that it takes place by a process of abstraction, the end product of which are interrelated concepts. The picture of reality is then a structure of concepts which are themselves a result of a selection from the multitude of sensory receptions or stimuli.

For common sense knowledge, as expressed by ordinary language, the selection is such that "uniformity comes where it matters socially".⁵ The common sense conceptual picture of the world is one based on the aim of conducting everyday affairs, and for this, "the immemorial doctrine of ordinary, enduring middle sized physical objects"⁶ has been shown to be adequate. As Tennant puts it, physical objects "are what we have reason to think exist in order to correlate and account for what is thrust on our senses and to make out of the class of sporadic diversities, a rational world, a world of entities persisting as identities in time".⁷ In spite of the fact that science grows from common sense knowledge, history reveals

⁴W.V.O. Quine, From a Logical Point of View (Cambridge: Harvard University Press, 1961), p. 44.

⁵W.V.O. Quine, Word and Object (Cambridge: M.I.T. Press, 1960), p. 8.

⁶Ibid., p. 11.

⁷F.R. Tennant, Philosophy of the Sciences (Cambridge: University Press, 1932), p. 134.

that the ordinary language account of the world becomes less and less adequate for the scientific purpose as the scientific process advances.⁸ This divergence is due presumably to the different aims which make for a different selection and hence different concepts.

Scientific Knowledge

Scientific knowledge develops as answers are found to particular kinds of questions--questions about 'the hidden potential',⁹ of the world. Initially these questions are put in the language of common sense, but as attempts are made to find answers, the methods used lead to necessary changes. These methods, which are found to be necessary in order to find answers that are acceptable, also lead to new questions and the reformulation of old questions into answerable states.¹⁰ Where the questions are about causes and conditions and there is a desire to find answers that are 'testable', science succeeds over common sense because "the methods of science are oriented towards obtaining the best conclusions".¹¹ Tennant characterizes science as being different on account of "two

⁸R. Lawson, Frustration. The Development of a Scientific Concept (New York: Macmillan Co., 1965), p. (vii).

⁹J. Bronowski, Science and Human Values (New York: Harper and Row, 1965), p. 14.

¹⁰R. Lawson⁴⁰, op. cit., pp. 4-5.

¹¹E. Nagel,⁸⁷ The Structure of Science (New York: Harcourt & Brace & World Inc., 1961), p. 9.

eliminations which science makes", namely an abstraction from "subjective factors in knowing" and also an abstraction of "certain aspects of objective data".¹² The concepts which are useful to science are ones that are testable, for for testability, the vagueness and ambiguity of ordinary language concepts is restrictive. Thus, as certain kinds of questions are asked about the world, science develops in response to these demands in the way best fitted to answering these questions.

The abstraction from the raw data which gives rise to the concepts must satisfy another requirement, as Merton suggests:

The choice of concepts guiding the collection and analysis of data is of course crucial to empirical enquiry. For to state an important truism, if concepts are selected such that no relationships between them obtain, the research will be sterile, no matter how meticulous the subsequent observations and inference. The importance of this truism lies in its implication that truly trial and error procedures in empirical inquiry are likely to be comparatively unfruitful since the number of variables which are not significantly connected is indefinitely large.¹³

Kaplan, too, stresses this requirement of scientific concepts:

What makes a concept significant is that the classification it institutes is one into which things fall, as it were of themselves. 'It carves at the joints' Plato said.¹⁴

¹²Tennant , op. cit., p. 135.

¹³R.K. Merton, "The Bearing of Empirical Research on the Development of Sociological Theory," American Journal of Sociology 50: 462-73, May 1945.

¹⁴A. Kaplan, The Conduct of Inquiry (San Francisco: Chandler, 1964), p. 50.

This requirement that the concepts be related is imperative because the ultimate of a science is knowledge that consists of theoretical systems. Both Bronowski and Popper picture these systems in the same way. Bronowski says:

We condense the laws around concepts so science takes its coherence, its intellectual and imaginative strength together from the concepts at which its laws cross, like knots in a mesh.¹⁵

Popper, writing more metaphorically says:

Theories are nets to catch what we call the world: to rationalize it, to explain it, and to master it. We endeavour to make the mesh ever finer and finer.¹⁶

These systems, (the result of the theoretical research mentioned in Chapter I) are not to be found by searching among multitudes of facts. They are rather creations of the scientists.

Their success is not that they follow from the real world, but that they predict a world which is essentially like ours.¹⁷

The aim, of course, is that they can be used to explain and predict, and so they are constructed with an eye to the facts and always with the requirement that testable deductions are fulfilled in the laboratory.

The categories express relations which are not immediately discerned or read off, but are read into the immediately

¹⁵J. Bronowski, Science and Human Values (New York: Harper & Row, 1965), p. 52.

¹⁶K. Popper, The Logic of Scientific Discovery (New York: Basic Book Inc., 1961), p. 59.

¹⁷J. Bronowski, The Common Sense of Science (London: Heinemann, 1951), p. 36.

given. They are first postulated then pragmatically verified.¹⁸

Because the theoretical systems are made up of concepts linked together by generalizations, the importance of choosing the right concepts, (as has been emphasized) is obvious. The fact that a choice (although it is a choice that must meet some demands) is possible, places demands on the creativity of the scientist,¹⁹ and makes scientific knowledge more than just an accumulation of facts. The theorizing and collecting of facts go on together as Kenyon suggests when he speaks of a 'theoretical-empirical balance'.²⁰ As Schwab has said:

The scientific knowledge at any given time rests not on the facts but on selected facts and the selection rests on the conceptual principles of inquiry.²¹

The data is conceptualized in ways in which we anticipate (or hope) will yield significant interconnections.²²

In addition to the conceptual structure of science, the syntactical structure has been stressed.²³ This draws attention to the view of science as producing conclusions from raw data. The syntactical structure is the pattern of

¹⁸Tennant, op. cit., p. 148.

¹⁹For a discussion of the creativity aspect of science see J. Bronowski, Science and Human Values (New York: Harper & Row, 1965).

²⁰G. Kenyon, loc. cit.

²¹J. Schwab, "The Concept of the Structure of a Discipline," Educational Record, 1962, 43:197.

²²A. Kaplan, op. cit., p. 51.

²³J.J. Schwab, op. cit., p. 203.

of its procedure, its methods, how it goes about using its conceptions to attain its goals.²⁴ Working in conjunction with the conceptual structure it determines what kinds of evidence are to be admitted, what kind of inferences can be made to produce the kind of order which this part of science is trying to put into the facts.²⁵ Differences in syntactical structure appear between the different disciplines or fields of knowledge because the different fields have different starting points and different goals.²⁶

Distinction Between the Disciplines

The reasons for the fact that scientific knowledge has developed in separate disciplines or fields of knowledge are obvious when the nature of the scientific process is considered. Once a question has been asked and answers are being sought in certain terms, the route the scientist must take is dictated by the results of his empirical testing.²⁷ Because the conceptual structure that develops is the one that best mirrors the particular phenomena being considered, questions about different phenomena often lead to separate, distinct conceptual systems. Once the questions have been prompted (for any reasons whatsoever),

²⁴Ibid.

²⁵J. Bronowski, The Common Sense of Science (London: Heinemann, 1951), pp. 41-49.

²⁶Schwab, op. cit., p. 204.

²⁷vide Kenyon, op. cit.: section on value-free orientation.

Each discipline has emerged from the undifferentiated field of prior human thought and proceeded to define and develop its realm, limited only by its ability to captivate human imagination, to produce viable concepts, to gether adherents and to marshall the acceptance and support of the university.²⁸

Kaplan stresses the pragmatic nature of the divisions between the disciplines when he says:

. . . each discipline may take from others techniques, concepts, laws, data, models, theories or explanations-²⁹ in short whatever it finds useful in its own inquiries.

This is an effort to avoid the dangers of discontinuity and of assuming that one area is the only area. A given area only provides a certain kind of answer to a certain kind of question, not the answer.³⁰ It must be remembered however that borrowing from other disciplines has its danger. The conceptual structure of a given discipline has developed with a particular aim as the guiding force, and hence the usefulness of the concepts may not be transferred along with the concepts into a different context. Meadows draws attention to the dangers and the sources of the danger when he says:

. . . unfortunately immature sciences, sensing their inadequacy frequently rush into print with demands that their research imitate the technic skills of older and more mature sciences. Such demands misread the history of science. The nature of the data, the nature of the situational limitations on observation of data in any given field, and especially the nature of the analytical problem historically determine the nature and development

²⁸A.R. King Jr. and J.A. Brownell, op. cit., p. 75.

²⁹A. Kaplan, op. cit., p. 4.

³⁰F. Tennant, op. cit., p. 5.

of the technical and symbolic stalls of a given science. Analogical fixations make psuedo sciences.³¹

Each discipline possesses a certain uniqueness. This uniqueness has grown as the discipline has developed by concerning itself with particular kinds of questions. Thus it should be assumed that answers to different kinds of questions will tend rather not to be automatically available in a given conceptual structure directed by different motivations. This lack of transferability of concepts in respect of their usefulness, is particularly important when one field of knowledge develops not out of ordinary language but out of a base of other fields of knowledge. Naturally as each discipline pursues its own conclusions new questions appear and old questions come to be seen in new ways. So, disciplines merge and new disciplines spring up between others as the questions are asked and answers become available. Because the aims determine the structure and the methods, new aims mean a new structure and new methods. To the extent that these are realized, to that extent is there a new discipline.

Values of the Conceptual Structure

Obviously the conceptual structure of a discipline can be fully identified only after the discipline has developed. However, its role in directing the work of the discipline makes it necessary to attempt identification as it is developing and thereby contribute to the knowledge being built through it.

³¹P. Meadows, "Science as Experience: A Genetic and Comparative Review, Am. Sociol. Rev.: 14 (Oct. 1949), p. 596.

This is the first important step in every science; the construction of a first order which is reasonable in itself and which holds to the experimental facts which are known to be true.³²

Once decided upon, always allowing that it may be changed, the conceptual structure, initially nothing more than an orientation with regard to answering questions about some phenomena,³³ serves a vital role in the development of knowledge. It will help in assessing available knowledge relevant to the aim of the field:

In making us more aware of the interconnections among items of existing knowledge which are now available in a scattered fragmentary form, it will help us fix our attention on the points where further work must be done.³⁴

By means of reference to the conceptual scheme, knowledge that exists in other fields can be formulated in a way so that its relevance to the concerns of the field can be seen.³⁵ In this way it can be incorporated into a systematic structure. The research by those who work in the field will both benefit and be benefitted by reference to the conceptual structure. Having the subject matter of the field structured will mean that there is a context within which to assess the extent of knowledge and ignorance. It will also provide theory-related hypotheses for research:

³³Ultimately of course the phenomena cannot be separated from the orientation but at the level of this discussion the distinction is useful.

³⁴T. Parsons, E.A. Shils, Toward a General Theory of Action (Cambridge: Harvard University Press, 1959), p. 1.

³⁵Report of the first Pi Lambda Theta Catena, The Body of Knowledge Unique to the Profession of Education (Washington: Pi Lambda Theta, 1966), p. 202.

. . . if research problems are formulated in terms of systematically derived theoretical hypotheses the resulting propositions will in turn contribute toward both the validation and revision of the theory.³⁶

The conceptual structure is the origin of the inquiry.³⁷ By continual reference to the conceptual structure, the workers in a discipline will be aware of the theoretical assumptions they are using.³⁸ By identifying hidden assumptions and discarding what has been shown to be unprofitable, the workers will develop knowledge which is more firmly based. In summary then

. . . the conceptual structure of a discipline determines what we shall seek the truth about and in what terms the truth shall be couched.³⁹

Thus workers in an area of inquiry who are aware of the developing conceptual structure will be able consciously to direct what they are doing, knowing in what terms their conclusions are to be expressed. Thus the field develops as knowledge is produced.

Summary

Factors in the foregoing discussion that are especially relevant to this study are as follows:

³⁶Parsons and Shils, loc. cit.

³⁷King and Brownell, op. cit., p. 82.

³⁸G.W. Carter, "Theory Development in Social Work Research," Social Service Rev. 29:1, March 1955, pp. 34-42.

³⁹J. Schwab, op. cit., p. 205.

(1) Each field of knowledge has a uniqueness that stems from its conceptual structure.

(2) The concepts which are used in a field of inquiry are the choice of those working in the field--the choice being expressed by the kind of question asked.

(3) The choice of concepts is guided by requirements of testability and interconnectedness.

(4) Concepts that have proved useful at one time or in one discipline may not maintain their value at another time or in another discipline.

(5) The divisions between the disciplines are valuable only in so far as they develop out of the process of inquiry.

(6) The conceptual structure expresses a common orientation to questions about an area of reality and as it develops, constitutes knowledge about that area of reality.

(7) The conceptual structure of a discipline provides the basis for integrated research in the discipline.

CHAPTER IV

THE NATURE OF A FIELD OF KNOWLEDGE OF PERFORMANCE

Man might have been a simple creature, his behaviour governed by the stars or by enlightened self interest, but he is not.

Scriven

For two thousand years we have tried to make of words and other notions an enduring semblance of the ways of our changing world. We are still not satisfied. We want more and better science, but we cannot always tell at once whether we need more facts or lack the proper notions.

Mcculloch

Introduction

The direct concern of this chapter is to show the nature of a field of knowledge which could result from the study of the interaction of man and his movements--the study of performance. From the last chapter it follows that the nature of a field of knowledge is determined by its conceptual structure. The outlining of the conceptual structure will serve to distinguish the field of knowledge of performance from other fields of knowledge which are involved in the study of the same phenomena.

The problem which is at hand is characterized by Wittgenstein when he says:

Suppose we are observing the movement of a point (for example a point of light on a screen). It might be possible to draw important consequences of the most various kinds from the behaviour of this point. And what a variety of observations could be made here! The path of the point and certain of its characteristic measures, (amplitude and wave-length for instance) or the velocity and the law according to which it varies, or the number or position of the places at which it changes discontinuously, or the curvature of the path at these places, and innumerable other things. -- Any of these features of its behaviour might be the only one to interest us. We might, for example, be indifferent to everything about its movements except for the number of loops it made in a certain time. -- And if we were interested, not in just one such feature but in several, each might yield us special information, different in kind from all the rest. This is how it is with the behaviour of man; with the different characteristic features which we observe in this behaviour.¹

Tennant also outlines the problem when he says:

As a physiologist or a physicist one can regard the human being as if he were a complicated machine, the changes within which admit of analysis and even theoretically speaking, of description in terms of equations; as a psychologist or historian one can regard a man as a personal being, the essence of whose individuality has disappeared in the physicist's account of him; as a theologian one looks upon a man as a member of a supersensible world, the child and the image of God, and as affording the one clue to the end which the physical universe subserves.²

Also Dyson, in speaking on the mechanics of athletics is aware of the situation:

I realize of course that an analysis of these principles is but one aspect of the examination of athletic performance which to the physiologist could be regarded as a phenomenon of cells, humours, tissues and nutrient fluids obeying organic laws; to a psychologist a consciousness

¹L. Wittgenstein, Philosophical Investigations (Oxford: Blackwell, 1963), Part II: V, p. 179.

²F. R. Tennant, Philosophy of the Sciences (Cambridge: University Press, 1932), p. 3.

and a personality. Certainly, in the analysis of human motion, allowance should be made for laws other than those of mechanics.³

To a certain extent the orientation has already been indicated by the terms of the definition, from which, as Brown and Cassidy suggest, the field of knowledge grows.⁴ This point can be seen easily, when it is recalled from Chapter III that the type of questions asked (the kind of problems felt) determine the orientation to the subject matter. Since the definition offered in Chapter II was developed as a summary account of the various approaches which characterize the subject area at present, that definition indicates the approach to be taken. Provided that the definition is adequate, the discrepancy between what is developed here and what actually exists must arise from either the logic of the arguments presented, or from the fact that those working in the field believe they are studying one thing and are in fact studying one or many other things. Thus the phenomena which are to be the subject of study of this field of knowledge--sports, games, exercise, training, play, dance, and everything else commonly called physical activities--are to be studied as performances, that is in terms of the interactions of man and his movements.

As indicated in Chapter III, the field of knowledge

³G.H. Dyson, "The Mechanics of Athletics," Journal of Health, Physical Education and Recreation, 37:6, June 1966, p. 30.

⁴C. Brown and R. Cassidy, Theory in Physical Education, A Guide to Programme Change (Philadelphia: Lea & Febiger, 1963), p. 53.

develops as questions are asked and answered about phenomena that are regarded as problematic. As Wittgenstein clearly shows in the passage quoted above, innumerable observations can be made and consequently many kinds of questions can be asked. The definition developed in Chapter II is an attempt to summarize, within the confines of the scholarly-professional distinction, the traditional interests of those working in Physical Education.

The kinds of questions asked about a phenomenon can be divided into two broad groups; questions about regularities and questions about differences. When a certain class of phenomena are being observed, certain trends and consistent features become apparent. One of the most famous examples in history is that of Newton noticing a similarity in the behaviour of apples falling from trees and the behaviour of the moon in relation to the earth. For some reason, men have been concerned to account for such regularities.

Often too, in observing phenomena certain irregularities or differences in behaviour become obvious and man again is led to ask "Why?" Thus, for example, explanations are sought for differences between sports skills performed under practice conditions and those performed under game conditions.

Both regularities and differences occur within individuals and between individuals. Traditionally interest has been both in changes in the observed movements and changes in man as a result of the movements he performs. Thus in studying the interaction of man and his movements the concern is to

describe and explain regularities and differences, within and between individuals, in both the effects of man on his movements and the effects of movement on man. In the conceptual structure that follows man will be considered both as an organism and as a personality. As will become evident, important implications for the field of knowledge follow from these facts.

Man as a Multi-dimensional Organism

The fact that man is the center of attention in this field of knowledge makes for special difficulties, and hence special challenges. These difficulties are suggested by Frank in his discussion of a discipline of human development that has great relevance for the field of knowledge of performance:

We have been schooled for a long time in fractionating wholes, such as organisms, into a number of seemingly distinct parts, more or less arbitrarily cutting up the whole according to our preconceptions and assumptions about the relation of variables.⁵

Frank elaborates on the above claim by pointing out that everywhere "organized complexities" (to use Weaver's well known phrase) such as "organisms, personalities, cultures, societies and human institutions, schools, hospitals and factories" can be recognized. In the past these have been studied, in terms of the pattern of classical science, as two variable (cause and effect) problems or as unorganized complexities. The assumption has been that these wholes could be

⁵L.K. Frank, "Human Development: An Emerging Scientific Discipline," in A. Solnit and S.A. Provence (ed.), Modern Perspectives in Child Development (New York: Int. Univ. Press Inc., 1963).

understood by adding together "discrete findings" gained from artificial experimental situations. However, in recent times largely as a result of Bertalanffy's work in general systems theory there has been an effort to study these phenomena as "functioning wholes".⁶ The problems in studying man as an organism are intensified in that we do not have an adequate terminology to deal clearly with circular, feed back processes while we continue to think in terms of stimulus and response situations, attributing different responses to different stimuli. Frank suggests two points of methodology that need to be observed in any study of man; the use of the concept of a process and the method of "biological relativity".

The concept of a process is particularly important. Recognizing that man brings to each situation all his previous experiences and that he is in constant interaction with his surroundings, any response he makes to a stimulus will be a "function of his present state or condition, patterned by his previous life experience".⁷ This resembles a Markoff process, in that the same stimuli may produce different responses or different stimuli the same response. Hunt also is aware of this in her model of movement behaviour when she says:

Since style is not envisioned as skill or a purposeful act it is not directed by the actual energy which impinges on the receptors or the specific precepts which result. Rather a manner of moving, operating in all

⁶Ibid., pp. 12, 13.

⁷Ibid., p. 16.

situations is the oblique reflection of the whole person arising from what he perceives, how⁸ he organizes his perception, and the concepts he forms.

This model of behaviour is particularly significant to Hunt because she is concerned to account for the style of movement.

Accepting that different responses cannot always be attributed to different stimuli, it becomes evident that one way of understanding behaviour is by considering the process which is operating to produce responses of various kinds. It is a matter then of postulating those particular processes which are needed to account for regularities in behaviour. It must be remembered, however, that man as an organism, is to be pictured as a series of interacting processes.

If processes are to be regarded as the unchanging elements in an approach to the study of man, and there are several processes operating together, it is necessary to employ the method of 'biological relativity',⁹ the second of Frank's points of methodology. In examining a patient, a doctor may have for his information data from several reports of x-rays, chemical tests, functional tests and so on. These are objective and perhaps even quantified. However he has to take into account such things as the past history, age, sex, and present state of the patient, and accordingly "enlarge or attenuate the significance of each quantified report, of each test".¹⁰

⁸V. Hunt, "Movement Behaviour: A Model for Action," Quest, Monograph II, April 1964, p. 70.

⁹Ibid., p. 17

¹⁰Ibid., p. 17.

Similarly, a science of man will have at its disposal data from those disciplines which have studied man in the traditional way. These data will need to be assessed for their relevance, and integrated by concentrating on man in terms of ongoing processes, and by developing models of these processes.

Today there is a growing recognition of the need for studying multidimensional dynamic events requiring conceptual models for their study, as distinguished from specific hypotheses concerned with the relation of two variables, abstracted from their organic context. Moreover these new conceptual models will enable us to think about processes that produce different products, and by such an approach we escape from the rigidities of linear cause-and-effect thinking and the search for mechanisms derived primarily from physical theory.¹¹

Such a study may give rise to a new field of knowledge based on the various life sciences but going beyond them. The important thing is that if it is claimed that man is being studied, as man, then it cannot be otherwise. As Scriven has said for the student of behaviour,

. . . there can be no reduction of macroscopic data to simple invariable regularities, whose existence could perhaps be explained by reference to a micro structure. Why not? Because the fundamental experimental element is the human being or his responses, enormously complex in structure and function and reared in a complex environment. There can be no practical sense in which this element can be reduced to simpler ones.¹²

This problem is also obvious to Hunt:

Of course discrete findings derived out of context with

¹¹Ibid., p. 11.

¹²M. Scriven, "A Possible Distinction between Traditional Scientific Disciplines and the Study of Human Behaviour," Minnesota Studies in Philosophy of Science, Vol. I, (University of Minnesota Press, 1964), p. 337.

the interacting moving person contribute nothing to an understanding of the whole man.¹³

Man as a Personality

However, man is more than an organism, in that he lives also in a symbolic world. Phenomena acquire meaning or significance to him. One of the phenomena he finds significant is himself in that he can pay attention to his own behaviour. In that the movements which are to be studied as performances are voluntary, they have some meaning or significance to the mover. He sees in his movement some factor or factors which make it significant in terms of achieving a goal or as expressing something he feels. Little is known about what people find significant about movement, or why people engage in physical activities.¹⁴ However the work of Kenyon¹⁵ on attitudes and the philosophical approaches of Metheny,¹⁶ Slusher,¹⁷ and

¹³Hunt, op. cit., p. 70.

¹⁴D.E. Byrd, G.L. Rarick, E.D. Greenwood, "Need: New Research Dimensions for Values of Lifetime Sports," Journal of Health, Physical Education and Recreation, 37:3, May 1966, p.36.

¹⁵Kenyon, "Assessing Attitude Toward Sport and Physical Activity," in L.F. Antonelli (ed.), Proceedings of First Int. Congress of Psychology of Sport, (Roma, 1965), pp. 811, 819.

¹⁶E. Metheny, Connotations of Movement in Sport and Dance (Dubuque, Iowa: W.C. Brown Co., 1965).

¹⁷H.S. Slusher, The Existential Function of Physical Education, Address at NAPECW Workshop, Interlachen, Michigan, June 17, 1964; Existential Psychology: Implications for Research in Physical Education, Address at WSPECW Conf, Squaw Valley, California, Oct. 30, 1964; Sport and Existence, An Analysis of Being, presented at the History and Philosophy Section of AAHPER Convention, Chicago, Mar. 21, 1966.

Kleinman¹⁸ have been concerned with these questions.

The identification of the movement meaning is but the first step in the study of performance. Once it has been identified, that is, a movement or set of movements has been interpreted, the scientist has the task of establishing performance meaning. The performance meaning is provided by the theory into which the scientist puts it.

If it is proper to say that the scientist tries to understand a phenomenon, we can also say that he tries to find what meaning it has.¹⁹

Thus the striking of a ball with a bat may have meaning for the batter as release of aggression. The scientist then having interpreted the impact of bat and ball, is concerned to give an account of aggressive behaviour. Or the impact may acquire its meaning in terms of its place in the game--that is in terms of its being a hit of a certain distance and accuracy under certain complex conditions.²⁰ Considering the movement in this perspective is a part of considering it as a performance. The meaning of this performance is provided in terms of a wider theory, of baseball behaviour, explaining why people engage in this kind of activity.

¹⁸S. Kleinman, Phenomenology--The Body--Physical Education, presented to the History and Philosophy Section AAHPER, National Convention, Chicago, Mar. 21, 1966; and The Significance of Human Movement, A Phenomenological Approach, presented at the Nat. Assoc. for P. E. of College Women Convention, Interlochen, Michigan, June 17, 1964.

¹⁹A. Kaplan, The Conduct of Inquiry (San Francisco: Chandler, 1964), p. 359.

²⁰This example is used by Kaplan.

Thus far the distinction between movement meaning and performance meaning exactly parallels that between the act meaning and action meaning with which sociologists are concerned. Regarding acts (movements) as meaningful, means viewing them as signs or symbols rather than in merely spatio-temporal terms. Whereas the sociologist is concerned with all actions, persons working in the field of knowledge being discussed here will be concerned with performances which are actions considered in terms of the interaction of man and his movements. Obviously any action may be considered in these terms, but attention has naturally been directed to those actions or that area of human behaviour where some feature of movement, perhaps force or quality or accuracy, has given it significance and made it an object of orientation.²¹

The ability of man to form concepts of his movement as emphasized by Metheny and Elfeldt²² with their term 'kine-symbol', by Hunt²³ and by Laban²⁴, means that movement can affect man in a vast number of ways. This feature of movement then opens a wide range of questions about psychological, social and cultural factors. The relationship of culture to

²¹T. Parsons and E.A. Shils (eds.), Towards a General Theory of Action (Cambridge: Harvard Univ. Press, 1959), p.56.

²²Metheny, op. cit., pp. 89-97.

²³Hunt, op. cit., p. 70.

²⁴R. Laban, The Mastery of Movement (London: McDonald and Evans, 1960), p. 14.

those features of movement that people find meaningful is indicated by Kane who says:

When soccer was first introduced into Kenya a game frequently would degenerate into a random contest to see which player could kick the ball the highest, and never mind the score.

and

Broad jump practice would turn into a rhythmic exercise, "ending with a jump of about six inches, all of the team working in complete union."²⁵

Obviously in a consideration of the meaning of movement the personality of the performer is important.²⁶ Not only do personality factors influence choice of activities but activities may influence personalities²⁷ (although as McAdam suggests, there is little evidence to support this).²⁸

In the preceding discussion 'man as an organism' and 'man as a personality' have been considered separately. Of course this distinction is artificial because two levels interact, in that man is a unified whole. To deny this would be to revert to the separation of mind and body. In describing and explaining performance it will always be necessary to take into account this interaction, i.e. to ask "What are the

²⁵N. Kane, "A Very Welcome Redcoat," Sports Illustrated, Dec. 1966, p. 80.

²⁶P.A. Roudik, "Psychophysiological Mechanisms of Surmounting Difficulties in Sports," in F. Antonell (ed.), op. cit., pp. 79-83.

²⁷V. Narancic, "Influence of Sport on Psychical Formation of Youth," in F. Antonell (ed.), op. cit., pp. 848-853.

²⁸K.J. McAdam, "The Place of P.E. in Character Training," Teacher Education 3, 1 May 1962, pp. 18-36.

effects of the mover's ideas of, and about this movement on the organismic factors controlling it?" and "What are the effects of such things as energy supply on the significance of the movement to the mover?".

A Conceptual Structure of Performance

In the conceptual structure that follows, it is important to recall the definition:

performance is the interaction of man and his movements, and the two principles:

- (1) man is an organism
- (2) man's movements are meaningful to him.

Performance can be analyzed in terms of the following concepts, which, in view of what has been said above, will be considered as processes:

- (1) the mechanical process
- (2) the energy process
- (3) the organization process
- (4) the growth process
- (5) the learning process.

The reasons why these particular factors have been selected as a means of capturing all the relevant variables are given in the section devoted to a discussion of each process.

Of course, as will become apparent, the processes are interacting and so no ultimate distinctions can be made between them. The continuity which will be obvious between the various processes, serves only to emphasize the integration

that is necessary in order to establish the meaning of performance.

The Mechanical Process

Because all change of motion is the result of forces, consideration must be given to the way in which man produces the forces upon which his motion depends. Regularities in the manner of production of forces are obvious, and these will constitute the mechanical process. As was emphasized above this process is circular: the forces that are produced cause subsequent responses to be altered. By developing a model of this interaction the sources of the changes and differences in movement may be located.

Man produces force by the tension he can develop in muscles acting through his skeleton. How the different muscles act to produce certain forces that result in the many movements that man can make will be included in the study of the mechanical process. The work of Hubbard²⁹ is an example of this kind of study. Hubbard discusses the role that muscular contraction plays in the movement of limbs, indicating that, particularly in fast movements, the muscle only initiates the motion which is continued due to the inertia of the limb.

Also of importance in the production of external forces are such things as the relative lengths of limb segments and

²⁹A.W. Hubbard, "Homokinetics: Muscular Function in Human Movement," in W. Johnson (ed.) Science and Medicine of Exercise and Sports (New York: Harper and Bros., 1961), pp. 7-39.

body proportions.³⁰

It is well accepted that changes take place in man as the result of the forces he produces. These changes further effect the forces that can be produced both positively through development of muscles, and negatively, as seen in work decrement curves. Such regularities as the increases in muscle size and strength associated with certain kinds of movements, and the loss of strength associated with disuse are universally accepted. However differences are apparent between individuals with regard both to the forces they can produce and the extent to which movement effects their production of greater forces. The area of muscular development forms a link between the mechanical process and the growth process.

Features of the nervous system have been seen to be relevant in the production of forces, as indicated in studies by Ikai and Steinhaus³¹ and Morehouse³² who stress the importance of psychical factors such as inhibition; and by Margaria and Gualtierotti³³ who discuss such factors as reflex time,

³⁰F.D. Sills, "Anthropometry in Relation to Physical Performance," in W. Johnson, op. cit., pp. 40-53.

³¹M. Ikai and A.H. Steinhaus, "Some Factors Modifying the Expression of Human Strength," Journal Applied Physical 16:1, Jan. 1961.

³²L. Morehouse, "Neurophysiology of Strength," in F. Antonelli (ed.), op. cit., pp. 147-149.

³³R. Margaria and T. Gualtierotti, "Functional Fundamental Characteristics of the Nervous System in Athletics and the Effects of Performance," Health and Fitness in the Modern World, Athletic Institute, 1961, pp. 162-171.

spinal delay, endplate delay, motor and sensory conduction speed in the general context of fatigue. Such studies also exemplify the overlapping between the mechanical and organization processes. Force is also important (as stress) in the development of bone patterns.

The Energy Process

Man in producing forces uses energy. This energy for motion has to be supplied over and above that required for the maintaining of basic metabolic processes. Identifiable regularities in the production, supply and utilization of energy will be the bases for the construction of a model of the energy process. This model can then be used to study the effects of motion on this process and also to study the ways in which this process is modified, by interaction with other processes, to produce different movements.

A study of the energy process would involve questions about the relative importance of such factors as oxygen consumption, oxygen supply, oxygen distribution in the body, and calorie supply, utilization and storage, in accounting for observed regularities and differences in movement. It is well accepted that two kinds of energy process (aerobic and anaerobic) operate under different conditions. The anaerobic process makes possible work of much greater intensity (over a short period of time), than that which could be achieved if the intensity was dependent on oxygen consumption.

The Organization Process

C.N. Loofbourrow states that "the coordinated operation of the skeletal musculature is one of the most obvious and important of body functions",³⁴ The presence of an organization process is made even more obvious when it is remembered that man's movement is complex, is directed to some purpose, and that it is successful on a great many occasions.³⁵

The organization process can be divided into two parts. Much of the coordination and integration that results in an organized response occurs at the automatic level, e.g. the relaxation of antagonists, the increasing of circulatory rate. However man can direct his activity and it is this property that opens a new realm of questions--as was indicated in the section "Man as a Personality". Not only can man form a concept of his movement but also he has some feeling or attitude towards it. If he regards it as important then he may be capable of new limits. If he ceases to see its value, he stops. In this way, the fact that man can pay attention to his movements, means that a kind of "filter" or "amplifier" is applied to all that can be accounted for at the organismic level.

Obviously perception is an important part of the

³⁴G.N. Loofbourrow, "Neuromuscular Integration," in Johnson, op. cit., p. 80.

³⁵of E. Jokl, "movements which originate as mentally conceived objectives which the neuromuscular system is capable of transforming into kinetic events." "The Acquisition of Skill," in F. Antonelli (ed.), op. cit., p. 84.

organization process as has been emphasized by Weber³⁶ and Smith³⁷. Hunt emphasizes the importance of figure ground perception in her account of a model of human behaviour.³⁸ Metheny has stressed the importance of the kinaesthetic process in the performance of movement.³⁹

The organization of these external sensory stimuli together with the internal factors such as hormones associated with emotion, maturation, inhibitions deriving from past experience to result in a movement that is optimal in achieving the aim of the performer, is still not understood. Several papers indicate problems about the relative importance of factors.⁴⁰ There is little doubt that servo-mechanism models are the most effective way of dealing at present with these problems.

³⁶of Weber, "Development of a Conceptual Model of Human Movement from Endocrine and Perceptual Theory with Analysis of the Effects of Aberrations on Movement," (unpublished Doctor of Education dissertation, University of California, Los Angeles, 1960).

³⁷L. Smith and J.S. Harrison, "Comparison of the Effects of Visual Motor, Mental, and Guided Practice upon Speed and Accuracy of Performing a Simple Eye-hand Coordination Task," Res Quarterly 33:299-307, 1962.

³⁸V. Hunt, op. cit., p. 74.

³⁹E. Metheny, Connotations of Movements in Sport and Dance (Dubuque, Iowa: Wm. C. Brown, 1965), pp. 67-78.

⁴⁰L. Morehouse, op. cit., pp. 147-149; P.R. Steggerda, "The Role of the Nervous System in Fitness," Exercise and Fitness, Athletic Institute, 1960, pp. 68-72; W.R. Johnson, "The Problem of Aggression and Guilt in Sports," in F. Antonelli (ed.), op. cit., pp. 187-189; W. Missivro, "Emotions and Human Performance," Health and Fitness in the Modern World, The Athletic Institute, 1961, pp. 199-206; Ikai and Steinhaus, loc cit.

That movement has an effect on the organization of movement is obvious from such regularities as the breakdown in organization of skilled behaviour that occurs with fatigue and also from the role of movement in learning.

The remaining two processes are derived from the fact that man exists, and changes through time. One series of changes that occur, are traditionally considered under the headings of growth and aging. The other series, made up of those special changes that occur under certain specified conditions is usually referred to as learning. Both these factors are to be considered as processes to account for the regularities that can be observed among individuals.

The Learning Process

That man learns his movements is without doubt but many questions arise about how the learning occurs. Metheny has stressed that what has traditionally been regarded as motor learning and considered separately from other learning is in fact the same process.⁴¹ Traditionally study of learning with regard to movement has been confined to movements considered as skills. However the role of learning in the ability to exert forces has been indicated.⁴² (This area generally regarded as training and kept distinct from the study of learning.) The work done on mental practice by

⁴¹Metheny, op. cit., p. 77.

⁴²Morehouse, op. cit., pp. 147-149.

Start⁴³ and others raises questions about the role of movement in learning. Regularities such as the effects of distribution and length of practice sessions are already well accepted.

The Growth Process

There is ample evidence to support the notion that as children grow their ability to perform movements changes. Equally it is clear that the aging process is accompanied by changes in the movements of which man is capable. However the effects which movement might have on the growth process and the aging process are less clearly understood, as are the mechanisms that relate movement to growth and aging.

Using growth as a general term, different kinds of growth have been identified to account for the observed regularities. Frank distinguishes incremental growth and replacement growth, the former being considered as a balance of retention over loss in the continuous exchange with the environment and the latter being concerned with the replacement of discarded cells.⁴⁴ The processes involved in these kinds of growth have importance for the understanding of training effects such as increase in muscular cross section, and for the understanding of the role of movement in rehabilitation.

⁴³K.B. Start, "Mental Rehearsal in the Learning and Performance of Motor Skills," in F. Antonelli (ed.), op. cit., pp. 739-740.

⁴⁴Frank, op. cit., pp. 22, 23.

Movement

Throughout the discussion of the various processes there has been constant reference to the effects of movement on each process and to the effect of each process on movement; that is the interaction of each process with man's movement. There still remains the problem of the terms to be used in the description of man's movement, as suggested by Hunt:

As a profession we should be the most skilled movement observers, yet we are neither reliable in our observations nor have we an accurate movement language.⁴⁵

It seems that there is little problem in describing movement accurately for some purposes. Adopting a mechanical approach, the motion can be described in terms of the forces acting in terms of space and time. Sometimes an anatomical classification is adequate. The difficulties arise when attempting to specify what might generally called the quality or style or "flavour"⁴⁶ of movement, where such things as flow, and rhythm are involved. No doubt the most highly developed approach is that of Laban and his followers. Since there has been always a separation between approaches like that of Laban and the approaches which allow for quantification, perhaps the solution is that given by Laban himself:

Only when the scientist learns from the artist how to acquire the necessary sensitivity to the significance of movement, and when the artist learns from the scientist how to bring order into his own visionary awareness of its inner meaning, can a balanced whole be created.⁴⁷

⁴⁵Hunt, op. cit., p. 73.

⁴⁶Ibid., p. 69.

⁴⁷Laban, op. cit., p. 101.

Laban provides the groundwork of such a synthesis by recognizing that human movement can be distinguished from mechanical motion by the feature of purposeful control (that is, the movement has some meaning to the performer) and that bodily action can always be specified by answering the four questions:

- 1) Which part of the body moves?
- 2) In which direction or directions of space is the movement exerted?
- 3) At what speed does the movement progress?
- 4) What degree of muscular energy is spent on the movement?⁴⁸

While it is clear that in some contexts answers to just one of these questions provide the most relevant factors of the movement, the interrelatedness of the processes listed above indicates that the person wishing to understand the movement as a performance must be continually aware of the other features of the movement. As Laban indicates, mechanical movement can be completely specified in terms of the forces and their points of application. From these two factors can be deduced factors ultimately defined in terms of space and time. The factors then of mass (of the parts in motion), the location in space and time, will be sufficient for accounts of the interaction of movement and the mechanical and every processes, and to a certain extent, the organization process. With regard to the organization process the general question of complexity and

⁴⁸Ibid., p. 27.

coordination arise. Complexity of motion is ultimately specifiable in terms of space and time.

Overlaying these questions however is the question of the meaning of the movement. How the mover regards the movement may effect his interaction with it. Hence one of the most important problems is to identify those features of movement to which people respond--in what way movements are meaningful. In attempting to account for changes or differences that might be occurring it is important that the observer and the performer see the same features of the movement as significant. Thus if the observer is concerned with precision it is important that the mover regards the precision of his movement as important. If it is significant to him rather as an artistic creation then observations may be misleading. Sometimes of course people may engage in physical activities for factors not directly associated with movement. Social reasons often seem important. Questions then arise about the reasons for a group gathering around a physical activity. This leads to the importance of social and cultural factors.

The solutions to this problem area, seem as crucial to a consideration of the effect of movement on man as they do to an understanding of why some activities are more popular than others, because how man sees his behaviour may effect his response.

Summary

There is no doubt that such a conceptual structure makes

for great difficulty for the scientist. However it must be realized that the difficulty derives from the phenomenon chosen for study. The conceptual structure merely represents a way of satisfactorily representing a part of reality, which in this case happens to be complex. In addition its complexity is of a kind that does not permit of isolation and fragmentation without continued attention to synthesis and integration. It is an organized complexity. Frank stresses this by stating:

But we must recognize that no one process or any single model will be adequate since we are dealing with a multi-dimensional organism--personality, moving through space time, undergoing a number of transformations, while carrying on a number of simultaneous functions,⁴⁹ and exhibiting a variety of behaviour and relationships.

It if is satisfactory the conceptual structure will serve three functions. Firstly it will enable the great mass of already available data to be integrated to provide an understanding of performance. This means a dependence on other disciplines but also indicates a new whole that is not merely the sum of its parts. As was indicated there is no reason to assume that the parts, untouched, are as relevant as they might appear to be, because the knowledge within a particular discipline is peculiarly oriented to the questions asked in that discipline. Secondly it provides a common orientation for future investigation within the field so that research, by growing out of organized knowledge will contribute to that organization. And thereby thirdly, it will help to take account of all the relevant variables, so avoiding an artificial and fragmentary account of performance.

⁴⁹Frank, op. cit., p. 21.

CHAPTER V

THE PLACE OF A FIELD OF KNOWLEDGE OF PERFORMANCE

Introduction

This chapter constitutes a summary of the main part of the thesis by showing what part a field of knowledge growing out of the conceptual structure developed in Chapter IV, occupies both in the total fabric of knowledge, and in the subject area of Physical Education.

Relation to Other Fields of Knowledge

It has already been suggested that in concerning itself with the study of performance, the inquiry involves more than a mere adding together of various facts from the already existing disciplines. While it is true that there is much that is relevant in these disciplines, it is by no means clear what things are relevant and how they are relevant. As the field of knowledge develops, the relevance of various factors will become apparent while others may be seen to be irrelevant. The conceptual structure at any given time is based on what is thought to be relevant at that stage of knowledge. Thus, although a physiologist and a person studying performance may be concerned with observing the same phenomenon, their orientations are different. The physiologist's concern is with

understanding processes that are connected with activity. The person studying performance is interested firstly in differences that can be observed in the movements of performers. He is then concerned to explain these differences in movement. Physiological factors may or may not be relevant. One kind of activity may affect or be affected by the organization process primarily, another the energy process. Basic knowledge about the processes of course will come from physiology or neuro-physiology. In the study of performance the interest is in the ways in which movement affects the process, which then further affects movement. In addition, it is necessary to remember that factors other than physiological are also operating to affect the movement. Because the performer has ceased to see the value of his movement, that is the meaning of the movement has changed, his motivation may decrease, and thereby bring about changes in the movement. The resultant changes in movement may make changes in the meaning process, (different features of the movement becoming significant), and thereby further change movements. The circularity of these relationships is obvious.

Thus although related disciplines may provide information about, or upon which to build models of the various processes, their relevance to a study of performance is only insofar as they affect man's movements or are affected by man's movements in such a way that further changes in movement result.

Thus it can easily be seen that there would be no distinct line between the new field of knowledge and those that

have traditionally supplied the facts for the subject matter of Physical Education. The distinctive feature of the new field of knowledge would be its orientation to the phenomena. Thus although a given phenomenon may be of interest to the physiologist because of its demonstration of some physiological process, of interest to the psychologist because it is an instance of a certain kind of behaviour, to the sociologist as the expression of a social process, to the anthropologist as an element of some significant part of a culture, it is a subject of study for this field of knowledge in that it can be considered as a performance. As a topic for the study of performance it is then a candidate for explanation. This is done by identifying the relevant variables, and by constructing theories that give meaning to these variables.

The Place Within the Subject Area

The place of the field of knowledge within the subject area has been defined as the relationship with the research and professional activities that make up the subject area. The relationship to research has already been indicated in the last two chapters. As research grows out of the field of knowledge, as problems are stated in terms of the conceptual structure, so will it contribute to, and modify that organization of knowledge. It remains then to consider the relationship to the professional activities of the subject area Physical Education.

As previously indicated, the main professional activity associated with the subject area of Physical Education is in

education, by means of the process called physical education. It has been maintained consistently that physical education must be a part of the total education process.

Traditionally the education process is carried out by the teachings of separate subjects in a school curriculum. It is assumed that each subject has some particular role in the total process, and also that each subject is taught in such a way as to contribute to general aims concerned with the development of the individual. It has been continually stressed that it is not merely the function of each subject to impart facts. For instance with regard to the teaching of science, it has been stated:

The teaching of science should give due emphasis to the nature of science itself. It should not be simply a collection of facts. It should show the way in which scientific conclusions are drawn by rational processes from observations and should emphasize the tentativeness of these conclusions. It should keep alive that curiosity and enthusiasm for learning which are so necessary for all intellectual pursuits.¹

and

All the new curricula encourage the student to behave like a scientist in the solution of problems.²

Of course not all the problems of life are amenable to scientific procedure. Hence subjects such as art and history, and

¹D. Wolfe, "Society, Education and Science" in N.B. Henry (ed.) Rethinking Science Education, Part I (University of Chicago Press, 1960), p. 857.

²J.S. Marshall and E. Burkman, Current Trends in Science Education (New York: The Center for Applied Res. in Education Inc., 1966), p. 10.

mathematics each carry with them their own special approaches. As indicated in Chapter II, the outcome of the education process, the educated man, has been identified by Belth as one who has come

. . . to grasp the meaning and the ability to think, on different occasions, historically, philosophically, scientifically, aesthetically and so on.³

Following this model of the education process the aim of physical education in being a part of the education process would be "to think in a physical education way".

The physical education teacher then has the task of getting his students "to think in a physical education way". Presumably this can be expanded to mean thinking in a certain way about that area of reality which is the focus of study in the field of knowledge of Physical Education. Just as a scientific education will result in an appreciation of the significance and place of science in the total world picture, together with the ability both to recognize problems that need a scientific approach and to operate with that approach, a physical education will result in an appreciation of the significance and place of man's movements in the total world picture. In these terms, being physically educated means then appreciating what role movement plays in man's life; what effects it has on man and what man can achieve through movement. Several authors recently have stressed the importance

³M. Belth, Education as a Discipline (Boston: Allyn and Bacon), p. 216.

of this kind of approach as distinct from an activity approach, as the following statements show:

Our primary responsibility is the development of key movement concepts, the classification of basic generalizations concerning human movement, and the guidance of individuals in the achievement of personal skills for effective and satisfying movement.⁴

There is considerable doubt that traditional programs of physical education are equipped by design or intent to serve the needs of children and youth today. The programs are almost exclusively activity oriented with little or no attention given to developing concepts about physical activity itself, or an understanding of the mechanics of movement.⁵

All of this is not to suggest of course that the physical education process in the schools should comprise a passing on of the field of knowledge of performance. This would be as absurd as to suggest that science education should comprise a passing on of the field of knowledge of science. Nor is it to suggest that the activity approach should cease. There is little doubt that actually taking part contributes much to the understanding. This has been stressed even with scientific education:

Natural phenomena and scientific methods must be learned through experience, verbalization is not enough. I don't pretend to understand why this is so; but I am convinced of it empirically as a result of a lifetime of teachings. Unless you get your hands into science and so have actual

⁴J. E. Nixon and A.E. Jewett, Physical Education Curriculum (New York: Ronald Press Co., 1964), p. 108.

⁵D. Herman and W. Osness, "A Scientific Curriculum Design for High School Physical Education," Journal of Health, Physical Education and Recreation, 37:3, Mar. 1966, p. 26.

physical experience of⁶ it, you really don't know it in the sense that you should.

Of course activity courses are necessary in providing the skills with which to make the phenomenon of movement a personal experience. However this is no doubt that an understanding of the significance of movement does not automatically follow from participation in a curriculum based on one of two arbitrarily selected sports. The nature of the curriculum is summed up in these two statements by the American Association for Health, Physical Education and Recreation:

The curriculum in a particular subject is commonly viewed as a carefully planned and selected sequence of related experiences. These experiences are designed to develop an orderly understanding of the significant concepts in some division of human knowledge and they are directed toward the development of skill in dealings with the symbols used to express that kind of understanding.

and

In the physical education curriculum these experiences are designed to develop an understanding of voluntary movement as a significant function of man. The central concepts or ideas of physical education are relevant to all movement oriented experiences but the immediate subject matter is most commonly organized as exercises, active games, sports and dances.⁷

In implementing such a curriculum the teacher needs knowledge of four areas. He needs knowledge of his pupils, their level of development being primary; he needs knowledge of teaching techniques, the effective ways of passing on

⁶P.B. Sears, "The Assimilation of Science into General Education," in I.B. Cohen and F.G. Watson (eds.) General Education in Science (Cambridge: Harvard University Press, 1952), pp. 34-35.

⁷This is Physical Education

knowledge; he needs a knowledge of education, its aims and principles; and finally he needs knowledge of a subject matter on the basis of which his part of the curriculum is planned. It is easily seen that a subject matter of the kind embodied in the field of knowledge of performance could be the basis for physical education being considered as an integral part in the education process. The other three areas of knowledge are in the realm of professional training and hence outside the direct scope of a study of performance, as a scholarly activity.

It is obvious that the field of knowledge of performance would provide information relevant to other professional activities. Any profession whose service needs knowledge that comes from the study of the interaction of man and his movements would be based partly on this field of knowledge. Its application in such professions as recreation and rehabilitation are readily apparent as its relevance, to a lesser extent, in such fields as drama and industry (where physical work is involved).

CHAPTER VI

SUMMARY

On the basis of a distinction between professional and scholarly activities within a subject area, and on the assumption that Physical Education as a subject area can support this distinction, it was the purpose of this study to investigate the scholarly area. This investigation was prompted by the opinion, expressed by many writers, that both the role and nature of the subject matter of Physical Education are poorly understood and that the development of the subject matter has been neglected in favour of professional activities.

The lack of a clearly defined subject matter can be considered a deficiency because the subject matter is the basis of both the research and the professional activities of the subject area. Hence both the development of the subject matter and its use will be adversely affected if confusion exists with regard to this central area.

In the framework being used, the subject matter may be considered as a field of knowledge. Recognizing that different fields of knowledge study different phenomena, the first step in establishing the nature of the field of knowledge in Physical Education was to identify its area of study. This was done by synthesizing a definition from those offered by

writers in the field. In order to do this it was necessary to pay attention to the clarification of terms, and then to apply the scholarly-professional distinction. As a result it was concluded that "the interaction of man and his movements" summarized the traditional interests of those working in the subject area of Physical Education (observing the scholarly-professional distinction). This definition directed attention to the facts that man organizes (affects) the movements of which he is capable and that he is affected by the movements he makes. Thus the definition includes those phenomena where the interest has been directed towards man's effects on his movements (games, sports, physical activities) and also those phenomena such as exercise, physical training and fitness where the interest has been on the effects of movements on man. When the phenomena are studied in terms of the interaction of man and his movements, they are considered as performances.

When the definition is expanded it indicates the nature of the field of knowledge, because the definition is a summary of the orientation to that part of reality being studied. A field of knowledge grows as problems are answered about that part of reality. As the knowledge develops, the concepts used to frame questions and answers are modified or replaced to fulfill criteria of testability and interconnectedness.

In the study of performance, man must be considered both as an organism and as a personality. These two levels interact. Because man is to be considered as an organism, the

traditional fragmentation and analysis for study (as found in the traditional disciplines) are unlikely to produce information of direct relevance to the understanding of performance. It was suggested that attention be directed to the processes going on in man, rather than to relating stimuli and responses. Man, then, is to be studied as a series of interacting processes. In order to account for man's movement and to provide a means of gathering the relevant variables in a form which enables synthesis, the following processes are necessary: the mechanical process, by means of which forces are produced; the energy process, by means of which energy is supplied; and the organization process, by means of which movement is controlled.

However, man lives in a symbolic world and he finds his movements meaningful. Thus it is necessary to account for the effects of this dimension on movement and also the effects of movements on man at this level. Thus the organization process is of two kinds: the automatic control of movements and the control due to the fact that man can pay attention to his movements. The meaning of the movement to the performer is an important feature of his interaction with the movement.

Man also exists through time and in order to account for some of the regularities and irregularities of performances it is necessary to take into account the growth process and the learning process.

A field of knowledge growing out of the conceptual

structure outlined, goes beyond those sciences which provide basic information. It considers man both as an organism and as a personality. It is also more specific in that it considers man in terms of his interaction with his movements. Performance, then is seen to be complex, and because the complexity is organized, basic knowledge must be integrated in a logical model which is kept constantly in mind. Research growing out of this model will contribute to the understanding of performance.

If the aim of physical education is to educate people with regard to a certain feature of their existence (namely their movement), then the field of knowledge suggested would be the source of the educator's subject matter. It would provide him with the kind of knowledge which is relevant to understanding performance and hence enable him to direct the process of physical education. Certain other professions could make use of knowledge of this kind in their service.

The complex nature of a field of knowledge as revealed by the conceptual structure of performance may be a deterrent to its development, for as King and Brownell indicate:

. . . each discipline has emerged from the indifferently differentiated field of prior human thought and proceeded to define and develop its realm, limited only by its ability to captivate human imagination, to produce viable concepts to gather adherents and to¹marshall the acceptance and support of the university.

The complexity cannot be otherwise when the same kinds of

¹A.H. King Jr. and J. Brownell, The Curriculum and the Disciplines of Knowledge (New York: John Wiley and Sons, Inc., 1966), p. 75.

questions are being asked. In developing methods of answering these questions instead of substituting answerable irrelevant questions lies the challenge for those concerned with the development of a field of knowledge in Physical Education.

BIBLIOGRAPHY

1. American Association for Health, Physical Education and Recreation, Professional Preparation in Health Education and Physical Education, Recreation Education. Washington, D.C.: AAHPER, 1962.
2. _____. This is Physical Education. Washington, D.C.: AAHPER, (Dept. N.E.A.), 1965.
3. Abernathy, Ruth. "The Search for Significant Persistent Themes in Physical Education," Journal of Health, Physical Education and Recreation, 36:3, Mar. 1965, pp. 26-29.
4. Abernathy, R. and Waltz, M. "Towards a Discipline; First Steps First," Quest, Monograph II, Spring Issue, April 1964.
5. Belth, M. Education as a Discipline. Boston: Allyn and Bacon Inc., 1965.
6. Boswell, D.M. "The Place of Physical Education in the School Curriculum," Journal of Canadian Association for Health, Physical Education and Recreation, 29:3, Feb.-Mar. 1963, p. 14.
7. Bronowski, J. Science and Human Values. New York: Harper & Row, 1965.
8. _____. The Common Sense of Science. London: Heinemann, 1951.
9. Brown, C. and Cassidy, R. Theory in Physical Education: A Guide to Program Change. Philadelphia: Lea and Febiger, 1963.
10. Bucher, C.A. Foundations of Physical Education. St. Louis: C.V. Mosby, 1960.
11. Byrd, D.E., Rarick, G.L., Greenwood, E.D. "Need: New Research Dimensions for the Values of Lifetime Sports," Journal of Health, Physical Education and Recreation, 37:3, Mar. 1966, p. 36.
12. Carter, G.W. "Theory Development in Social Work Research," Social Science Review, 29:1, Mar. 1955, pp. 34-42.

13. Cowell, Charles C. Scientific Foundations of Physical Education. New York: Harper and Brothers, 1953.
14. Cowell, C.C. and France, W. Philosophy and Principles of Physical Education. Englewood Cliffs, N.J.: Prentice-Hall, 1963.
15. Cunningham, D.A. (M.Sc.) "Physical Education as an Academic Discipline," Journal of Canadian Association of Health, Physical Education and Recreation 31:6, Aug. 1965, p. 21.
16. Daniels, A.S. "The Potential of Physical Education as an Area of Research and Scholarly Effort," Journal of Health, Physical Education and Recreation, Jan. 1965, p. 32.
17. Dyson, G.H. "The Mechanics of Athletics," Journal of Health, Physical Education and Recreation, 37:6, June 1966, p. 30.
18. Forscher, B.K. "Chaos in the Brickyard," Science 142, October 8, 1963, p. 2590.
19. Frank, L.K. "Human Development: An Emerging Scientific Discipline," in A. Solnit and S.A. Provence (eds.) Modern Perspectives in Child Development. New York: Int. Univ. Press Inc., 1963.
20. Habenstein, R.W. "Critique of 'Profession' as a Sociological Category," The Sociological Quarterly (Midwest Sociological Society), Autumn 1963.
21. Henry, F.M. "Collegiate Physical Education and Research," Address at Western College Men's Physical Education Soc. Annual Meeting, Reno, Nevada, Oct. 1964.
22. _____. "Physical Education: An Academic Discipline," Journal of Health, Physical Education and Recreation, 35:32-3, Sept. 1964.
23. Herman, D. and Osness, W. "A Scientific Curriculum Design for High School Physical Education," Journal of Health, Physical Education and Recreation 37:3 Mar. 1966, p. 26.
24. Hubbard, A.W. "Homokinetics: Muscular Function in Human Movement," in W.R. Johnson (ed.) Science and Medicine of Exercise and Sports. New York: Harper and Brothers, 1960, pp. 7-39.
25. Hunt, V. "Movement Behaviour: A Model for Action," Quest Monograph II, April 1964, pp. 69-91.

26. Ikai, M. and Steinhaus, A.H. "Some Factors Modifying the Expression of Human Strength," Health and Fitness in the Modern World, Chicago: The Athletic Institute, 1961, pp. 148-161.
27. Jokl, E. "The Acquisition of Skill," in F. Antonelli Proceedings of First International Congress of Psychology of Sport, Rome, 1965. pp. 84-100.
28. _____. Medical Sociology and Cultural Anthropology of Sport and Physical Education. Springfield: Charles C. Thomas, 1964.
29. Johnson, P.B. "An Academic Approach to College Health and Physical Education," Journal of Health, Physical Education and Recreation, 37:3, Mar. 1966, p. 23.
30. Johnson, W. "The Problem of Aggression and Guilt in Sports," in F. Antonelli (ed.) Proceedings of First International Congress of Psychology of Sport, Rome 1965, pp. 187-189.
31. Kane, M. "A Very Welcome Redcoat," Sports Illustrated, Dec. 1966, p. 80.
32. Kaplan, A. The Conduct of Inquiry. San Francisco: Chandler Pub. Co., 1964.
33. Kenyon, G.S. "Sport Sociology: On Becoming a Sub Discipline," Paper read at the History and Philosophy Section AAHPER National Convention, Chicago, 1966.
34. _____. "Assessing Attitudes Toward Sport and Physical Activity," in F. Antonelli (ed.) Proceedings of First International Congress of Psychology of Sport, Rome, 1965, pp. 811-819.
35. King, A.R. Jr. and Brownell, J.A. The Curriculum and the Disciplines of Knowledge. New York: John Wiley and Sons Inc., 1966.
36. Kleinman, S. "The Significance of Human Movement: A Phenomenological Approach," Presented at the NAPECW Convention, Interlochen, Michigan, 1964.
37. _____. "Phenomenology--The Body Physical Education," Presented to the History and Philosophy Section AAHPER Convention, Chicago, 1966.
38. Laban, R. The Mastery of Movement (2nd Edition). London: McDonald & Evans, 1960.
39. Lawson, R. Frustration: The Development of a Scientific Concept. New York: Macmillan Co., 1965.

40. L'Heureux, W.J. "The Tait McKenzie Memorial Address," Journal of Canadian Association of Health, Physical Education and Recreation 32:2, Dec.-Jan. 1966, p. 4.
41. Locke, L.F. "The Use of Theory in Physical Education," Aust. Journal of Physical Education, 25, 1962, p. 15.
42. Loofbourrow, G.N. "Neuromuscular Integration," in W.R. Johnson (ed.) Science and Medicine of Exercise and Sport. New York: Harper and Brothers, 1960, pp. 80-107.
43. Malinowski, B. A Scientific Theory of Culture and Other Essays. New York: Oxford Univ. Press, 1960.
44. Margenau, H., Bergamini, D. et al. The Scientist. New York: Life Science Library, Time Inc.
45. Marshall, J.S. and Burkman, E. Current Trends in Science Education. New York: The Center for Applied Res. in Education Inc., 1966.
46. McAdam, K. "The Place of Physical Education in Character Training," Teacher Education 3 May 1, 1962, pp. 18-36.
47. McCloy, C.H. Philosophical Bases for Physical Education. New York: F.S. Crofts and Co., 1947.
48. _____. "A Reply to Dr. Williams and Dr. Oberteuffer," Physical Educator X:4 Dec. 1953, pp. 101-103.
49. McCulloch, W.S. "Finality and Form in Nervous Activity," Monograph in American Lectures in Psychology. Springfield, Ill.: Charles C. Thomas, 1952.
50. Meadows, P. "Science as Experience, A Genetic and Comparative Review," Am. Sociological Review, 14: Oct. 1949, pp. 592-99.
51. Merton, R.K. "The Bearing of Empirical Research upon the Development of Sociological Theory," American Journal of Sociol. 50: May 1945, pp. 462-73.
52. Metheny, E. Connotations of Movement in Sport and Dance. Dubuque, Iowa: Wm. C. Brown Co., 1965.
53. Missiaro, W. "Emotions and Human Performance," Health and Fitness in the Modern World, Chicago: The Athletic Institute, 1961, pp. 199-206.
54. Morehouse, L.E. "Neurophysiology of Strength," in F. Antonelli (ed.) Proceedings of First International Congress of Psychology of Sport. Rome 1965, pp. 147-149.

55. Nagel, E. The Structure of Science. New York: Harcourt Brace and World Inc., 1961.
56. Narancic, V. "The Influence of Sport over Psychical Formation of Youth," in F. Antonelli (ed.) Proceedings of First International Congress of Psychology of Sport, Rome 1965, pp. 848-853.
57. Neilson, N.P. and Bronson, A.O. Problems in Physical Education. Englewood Cliffs, N.J.: Prentice Hall Inc., 1965.
58. Nixon, E.W. and Cozens, F.W. An Introduction to Physical Education. Philadelphia: W.B. Saunders Co., 1942.
59. Nixon, J.E. and Jewett, A.E. Physical Education Curriculum. New York: Ronald Press Co., 1964.
60. Oberteuffer, D. Physical Education. New York: Harper and Bros., 1951.
61. Orban, W.A. "Research and Our Profession," Journal of Canadian Association of Health, Physical Education and Recreation, Vol. 28:4, 1962, p. 30.
62. Parsons, T. and Shils, E.D. (ed.) Toward a General Theory of Action. Cambridge, Mass.: Harvard Univ. Press, 1959.
63. The Body of Knowledge Unique to the Profession of Education, Report of the First Pi Lambda Theta Catena, Washington: Pi Lambda Theta, 1966.
64. Popper, K. The Logic of Scientific Discovery. New York: Basic Book Inc., 1961.
65. Postma, J.W. "The Theory of Physical Education as a Scientific Discipline," Physical Education 55:164, March, 1963.
66. Quine, W.V.O. Word and Object. Cambridge, Mass.: M.I.T. Press, 1964.
67. Randall, M.W. Modern Ideas on Physical Education (2nd Edition). London: G. Bell and Sons Ltd., 1961.
68. Robinson, R. Definition. Oxford: Clarendon Press, 1954.
69. Rudik, P.A. "Psychophysiological Mechanism of Surmounting Difficulties in Sports," in F. Antonelli (ed.) Proceedings of First International Congress of Psychology of Sport, Rome 1965, pp. 79-83.

70. Schrecker, K.A. "Scientific Physical Education?" Physical Education, Vol. 44, 133, 1952.
71. Schwab, J.J. "The Concept of the Structure of a Discipline," Educational Record, 1962, 43:197.
72. Scriven, M. "A Possible Distinction Between Traditional Scientific Disciplines and the Study of Human Behaviour," Minnesota Studies in Philosophy of Science Vol. I: University of Minnesota Press, 1964, pp. 330-340.
73. Sears, P.B. "The Assimilation of Science into General Education," in I.B. Cohen and F.G. Watson (eds.) General Education in Science. Cambridge, Mass.: Harvard Univ. Press, 1952, pp. 34-45.
74. Sheldon, R.C. "Some Observations on Theory in Social Science," in T. Parsons and E.A. Shils (eds.) Toward a General Theory of Action. Cambridge, Mass.: Harvard Univ. Press, 1959.
75. Sills, F.D. "Anthropometry in Relation to Physical Performance," in W.R. Johnson (ed.) Science and Medicine of Exercise and Sports. New York: Harper and Brothers, 1960, pp. 40-53.
76. Slusher, H.S. "Sport and Existence: An Analysis of Being," presented at the History and Philosophy Section AAHPER Convention, Chicago, 1966.
77. _____. "Existential Psychology: Implications for Research in Physical Education," Address at WSPECW Conference, Squaw Valley, California, 1964.
78. _____. "The Existential Function of Physical Education," Address at NAPECW Workshop, Interlochen, Michigan, 1964.
79. Smith, L. and Harrison, J.S. "Comparison of the Effects of Visual Motor Mental, and Guided Practice upon Speed and Accuracy of Performing a Simple Eye-Hand Coordination Task," Research Quarterly of AAHPER 33:299-307, 1962.
80. Snyder, R. "The Scope of Physical Education," Current Administrative Problems, AAHPER, Washington, 1960, p.52.
81. Start, K.B. "Mental Rehearsal in the Learning and Performance of Motor Skills," in F. Antonelli (ed.) Proceedings of First International Congress of Psychology of Sport, Rome 1965, pp. 739-740.
82. Steinhaus, A.H. (Ph.D.) Toward an Understanding of Health and Physical Education. Dubuque, Iowa: Wm. C. Brown Co., 1963.

83. Steggerda, F.R. "The Role of the Nervous System in Fitness," Exercise and Fitness. Chicago: The Athletic Institute, 1960, pp. 68-72.
84. Taba, H. Curriculum Development Theory and Practice. New York: Harcourt Brace and World Inc., 1962.
85. Taylor, B.M. "Implications of the Fitness Movement," Journal of Canadian Association of Health, Physical Education and Recreation 30:2, 1964, p. 19.
86. Tennant, F.R. Philosophy of the Sciences. Cambridge: University Press, 1932.
87. Van Dalen, D.B., Mitchell, E.D. and Bennett, B.L. A World History of Physical Education. Englewood Cliffs, N.J.: Prentice-Hall, 1956.
88. Weaver, W. "Science and Complexity," American Scientist, 36:4, 1948, pp. 536-544.
89. Weber, M.E. "Development of a Conceptual Model of Human Movement from Endocrine and Perceptual Theory with Analysis of the Effects of Aberrations on Movement," unpublished Doctor of Education Dissertation, Univ. of California, Los Angeles, 1960.
90. Williams, J.F. The Principles of Physical Education (7th Ed.) Philadelphia: W.B. Saunders Co., 1959.
91. Wittgenstein, L. Philosophical Investigations. Oxford: Blackwell, 1963.
92. Wolfe, D. "Society, Education, and Science," in N.B. Henry (ed.) Rethinking Science Education Pt. I. University of Chicago Press, Ill., 1960.

B29864